

*REMARKS*

*Discussion of Amendments*

Claims 1, 38, and 39 have been amended to recite that the uncoated phosphor is a sulfide or oxide phosphor. New claims 40-41 have been added and are supported by the specification at page 3, lines 30-32. No new matter has been added.

*The Office Action*

The Office Action sets forth the following grounds for rejection:

(1) claims 1-7 and 36-39 are rejected on the ground of obviousness-type double patenting as allegedly unpatentable over claims 15-28 of US Patent 6,699,523;

(2) claims 1-7 and 37-39 are rejected under 35 U.S.C. § 102(b) as allegedly anticipated by Ronda et al. (U.S. Patent No. 6,150,757); and

(3) claims 2-6 are rejected under 35 U.S.C. § 103(a), as allegedly unpatentable over Ronda et al. in view of discussion provided by the Office.

*Discussion of Rejections*

(1) Obviousness-type Double Patenting Rejection

Applicants enclose herewith a Terminal Disclaimer as an administrative convenience to remove the rejection. The filing of a Terminal Disclaimer is not to be construed as acquiescence that the claimed invention is in fact obvious as the Office has claimed. *Quad Environmental Tech. v. Union Sanitary District*, 946 F.2d 870, 20 USPQ2d 1392 (Fed. Cir. 1991). Accordingly, the double patenting rejection should be removed. New claims 40-41 also should not be rejected on this basis.

(2) Anticipation Rejection

Applicant has amended claims 1, 38, and 39 to recite that the phosphor is a sulfide or oxide phosphor. The claim amendment renders the rejection moot. New claims 40-41 also should not be rejected on this basis.

## (3) Obviousness Rejection

The Office argues that it is known in the art BAM phosphor and ZnS:Cu phosphor are extensively used in low pressure mercury discharge lamp. The Office cites US 6,888,302 to Juestel et al., col. 2, lines 16-26 in support of this assertion. Applicants respectfully submit that the Office is in error. Juestel et al. is not prior art to the present application, which claims a priority date of December 22, 1999. In contrast, the earliest US filing date of Juestel et al. is May 24, 2001. The Office cannot and should not rely on Juestel et al. as prior art. Accordingly, the obviousness rejection is erroneous and should be withdrawn.

In addition, applicant has shown that the combination of the rare earth oxide coating and the sulfide or oxide phosphor provides a synergistic effect when the coated phosphor is employed in a field emission display device. As described in the specification, page 3, lines 20-32, the surface coated phosphor shows an improved cathodoluminescence efficiency, improved aging resistance, oxidative stability, and chemical stability. The rare earth oxide layer protects the surface of the phosphor against chemical and oxidative degradation. The rare earth oxide coating also passivates the surface of the phosphor, for example, prevents the formation of recombination centers.

As the rare earth oxide coated phosphor is irradiated with electrons in a display device, the electrons produce an electron-hole pairs, which recombine to form photons. If the surface of the phosphor has defects, then such defects would abruptly terminate the formation of photons. Defects would increase non-radiative recombination of electron-hole pairs. Consequently, high rates of non-radiative recombination of the electron-hole pair would decrease the luminescence efficiency. The rare earth oxide coating fulfills an important function in that, it not only provides a physical barrier by protecting the surface of the phosphor from contamination but also increases the luminescence efficiency of the phosphor by passivating the defect centers on the surface. The coating thus acts as an emission assisting layer.

The claimed invention provides more than a predictable yield, which should strongly speak to its non-obviousness. see, e.g., *KSR Int'l Co. v. Teleflex Inc.*, 127 S. Ct. 1727, 1731 (2007). The *KSR* Court referred to two earlier decisions by the U.S. Supreme Court. *U.S. v. Adams* and *Anderson's-Black Rock Inc. v. Pavement Salvage Co.*

In *U.S. v. Adams*, 383 U.S. 39 (1966), the patent was directed to a wet battery that varied from prior designs in two ways: It contained water, rather than the acids conventionally employed in storage batteries; and its electrodes were magnesium and cuprous chloride, rather than zinc and silver chloride. The U.S. Supreme Court recognized that when a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result. The U.S. Supreme Court rejected the Government (losing party)'s argument that Adam's battery was obvious. The U.S. Supreme Court considered the fact that the elements worked together in an unexpected and fruitful manner supported the conclusion that Adams' design was not obvious to those skilled in the art. Similarly, here the claimed invention provides more than a predictable yield, i.e., improvement in luminescence efficiency due to passivating of the defects, which was totally unpredictable at the time of the invention.

Further, the presently claimed invention is quite unlike *Anderson's-Black Rock, Inc. v. Pavement Salvage Co.*, 396 U.S. 57 (1969), where the patentee had merely combined two pre-existing elements - a radiant heat burner and a paving machine, where the resulting device did not create any new synergy. The radiant heat burner functioned just as a burner was expected to function; and the paving machine did the same. The two in combination did no more than they would in separate, sequential operation. In those circumstances, according to the Supreme Court, the combination of the old elements added nothing to the nature and quality of the radiant-heat burner already patented, and the patent failed under Section 103.

The presently claimed invention, in contrast, achieves a new synergy, which is neither disclosed nor suggested to those of ordinary skill in the art by Ronda. The new synergy is the increase in luminescence efficacy. In Ronda, there is no increase in efficiency; Ronda merely teaches a surface protective layer which prevents the phosphor from absorbing mercury vapor. Thus, the protective layer prevents deterioration of the efficiency, *not* increase in efficiency. see, for example, Fig. 1 of Ronda and the description at col. 4, lines 60-65 ("FIG. 1 shows on the vertical axis the luminous efficacy  $\eta$  of the lamps in lm/W. It can be seen that the lamps provided with BAM coated with  $Y_2O_3$  have the lowest *decrement* in luminous efficacy during the first 1000 hours of operation. All lamps with coated BAM have a *lower* luminous efficacy than lamps with uncoated BAM at 0 hours" (*emphasis added*)).

In distinct contrast, the presently claimed invention yields an increase in efficacy; see, for example, Example 2, where it is illustrated that after 60,000 seconds of aging under a pulsed electron beam, the coated phosphor has a CL efficiency of about 10% *higher* than the uncoated phosphor. Increase in efficiency, as applicants have achieved is remarkable and not at all predictable from what was known in the art at the time the presently claimed invention was made. In fact, applicants respectfully submit, it is truly surprising and unexpected.

In view of all of the foregoing, the obviousness rejection of the pending claims is erroneous and should be withdrawn. New claims 40-41 also should not be rejected on this basis. Ronda fails to suggest a method of improving luminescence of a sulfide or oxide phosphor, which will be irradiated by electrons. Ronda merely teaches a method of preventing deterioration of the luminescent efficiency of the phosphor when used in a low pressure mercury vapor lamp. Mercury vapor lamp does not operate by the irradiation of electrons on the phosphor but simply by photons on the phosphor. Those of ordinary skill in the art would not expect that when a phosphor is coated with a rare earth oxide and such coated phosphor is irradiated with electrons, the luminescence would increase.

Absorption of mercury is not even a problem in luminescence display applications. The principle by which Ronda's low pressure mercury vapor lamp operates is distinctly different from the principle by which a luminescent device operates. In Ronda, the luminescence arises from the conversion of a photon of one wavelength to a photon of a different wavelength. In contrast, the luminescence of the presently claimed invention arises from the conversion of an electron into a photon. There is no similarity in the problem; there is no similarity in the result obtained. Any similarity in the eyes of the Office should only come from the glare of blinding hindsight. It is well established that hindsight is impermissible under the law as it contravenes the statutory mandate of casting the obviousness inquiry to the time the claimed invention was made rather than to the time of examination of the application. See, e.g., *Amgen, Inc. v. Chugai Pharm. Co.*, 18 U.S.P.Q. 2d 1016 (Fed. Cir. 1991).

*Conclusion*

Applicants respectfully submit that the patent application is in condition for allowance. If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,



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